

CLAIMS:

1. An optical recording medium comprising a substrate and a plurality of recording layers laminated via at least intermediate layers, at least one of the recording layers other than a recording layer farthest
5 from a light incidence plane among the plurality of recording layers containing at least one metal M selected from a group consisting of Ni, Cu, Si, Ti, Ge, Zr, Nb, Mo, In, Sn, W, Pb, Bi, Zn and La and an element X which can combine with the metal M upon being irradiated with a laser beam for recording data, thereby forming a crystal of a compound of the
10 element X with the metal M.
2. An optical recording medium in accordance with Claim 1, wherein all of the recording layers other than the farthest recording layer from the light incidence plane among the plurality of recording layers contain at
15 least one metal M selected from a group consisting of Ni, Cu, Si, Ti, Ge, Zr, Nb, Mo, In, Sn, W, Pb, Bi, Zn and La and an element X which can combine with the metal M upon being irradiated with a laser beam for recording data, thereby forming a crystal of a compound of the element X with the metal M.
- 20 3. An optical recording medium in accordance with Claim 1, wherein all of the recording layers other than the farthest recording layer to the light incidence plane among the plurality of recording layers contain at least one metal M selected from a group consisting of Ni, Cu, Si, Ti, Ge, Zr,
25 Nb, Mo, In, Sn, W, Pb, Bi, Zn and La and an element X which can combine with the metal M upon being irradiated with a laser beam for recording data, thereby forming a crystal of a compound of the element X with the metal M, and are formed in such a manner that the recording layers

closer to the light incidence plane are thinner.

4. An optical recording medium in accordance with Claim 3, which comprises a first recording layer, a second recording layer and a third recording layer on the substrate in this order and the first recording layer, the second recording layer and the third recording layer are formed so that the second recording layer has a thickness of 15 nm to 50 nm and that a ratio of the thickness of the third recording layer to the thickness of the second recording layer is 0.40 to 0.70.

5. An optical recording medium in accordance with Claim 3, which comprises a first recording layer, a second recording layer, a third recording layer and a fourth recording layer on the substrate in this order and the first recording layer, the second recording layer, the third recording layer and the fourth recording layer are formed so that the second recording layer has a thickness of 20 nm to 50 nm, that a ratio of the thickness of the third recording layer to the thickness of the second recording layer is 0.48 to 0.93 and that a ratio of the thickness of the fourth recording layer to that of the second recording layer is 0.39 to 0.70.

6. An optical recording medium in accordance with Claim 1, wherein the element X is constituted of at least one element selected from a group consisting of S, O, C and N.

7. An optical recording medium in accordance with Claim 2, wherein the element X is constituted of at least one element selected from a group consisting of S, O, C and N.

8. An optical recording medium in accordance with Claim 3, wherein the element X is constituted of at least one element selected from a group consisting of S, O, C and N.

5 9. An optical recording medium in accordance with Claim 4, wherein the element X is constituted of at least one element selected from a group consisting of S, O, C and N.

10. An optical recording medium in accordance with Claim 5, wherein
10 the element X is constituted of at least one element selected from a group consisting of S, O, C and N.

11. An optical recording medium in accordance with Claim 1, wherein
the at least one recording layer containing the metal M and the element X
15 further contains at least one metal selected from a group consisting of Mg, Al and Ti.

12. An optical recording medium in accordance with Claim 2, wherein
the at least one recording layer containing the metal M and the element X
20 further contains at least one metal selected from a group consisting of Mg, Al and Ti.

13. An optical recording medium in accordance with Claim 3, wherein
the at least one recording layer containing the metal M and the element X
25 further contains at least one metal selected from a group consisting of Mg, Al and Ti.

14. An optical recording medium in accordance with Claim 4, wherein

the at least one recording layer containing the metal M and the element X further contains at least one metal selected from a group consisting of Mg, Al and Ti.

5 15. An optical recording medium in accordance with Claim 5, wherein the at least one recording layer containing the metal M and the element X further contains at least one metal selected from a group consisting of Mg, Al and Ti.

10 16. An optical recording medium in accordance with Claim 6, wherein the at least one recording layer containing the metal M and the element X further contains at least one metal selected from a group consisting of Mg, Al and Ti.

15 17. An optical recording medium comprising a substrate and a plurality of recording layers laminated via at least intermediate layers, at least one of the recording layers other than a recording layer farthest from a light incidence plane among the plurality of recording layers containing at least one kind of metal selected from a group consisting of
20 Ni, Cu, Si, Ti, Ge, Zr, Nb, Mo, In, Sn, W, Pb, Bi, Zn and La and at least one element selected from a group consisting of S, O, C and N as a primary component and being added with at least one metal selected from a group consisting of Mg, Al and Ti.

25 18. An optical recording medium in accordance with Claim 17, wherein all of the recording layers other than the farthest recording layer from the light incidence plane among the plurality of recording layers contain at least one metal selected from a group consisting of Ni, Cu, Si,

Ti, Ge, Zr, Nb, Mo, In, Sn, W, Pb, Bi, Zn and La and at least one element selected from a group consisting of S,O, C and N as a primary component and to be added with at least one metal selected from a group consisting of Mg, Al and Ti.

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19. An optical recording medium in accordance with Claim 17, wherein all of the recording layers other than the farthest recording layer from the light incidence plane among the plurality of recording layers contain at least one metal selected from a group consisting of Ni, Cu, Si,
10 Ti, Ge, Zr, Nb, Mo, In, Sn, W, Pb, Bi, Zn and La and at least one element selected from a group consisting of S,O, C and N as a primary component and to be added with at least one metal selected from a group consisting of Mg, Al and Ti, and are formed in such a manner that the recording layers closer to the light incidence plane are thinner.

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20. An optical recording medium in accordance with Claim 17, wherein the recording layer containing at least one metal selected from a group consisting of Ni, Cu, Si, Ti, Ge, Zr, Nb, Mo, In, Sn, W, Pb, Bi, Zn and La and at least one element selected from a group consisting of S,O, C and
20 N as a primary component and being added with at least one metal selected from a group consisting of Mg, Al and Ti is formed by a vapor growth process using a target containing at least one metal selected from a group consisting of Ni, Cu, Si, Ti, Ge, Zr, Nb, Mo, In, Sn, W, Pb, Bi, Zn and La and at least one element selected from a group consisting of S,O, C
25 and N as a primary component and a target containing at least one metal selected from a group consisting of Mg, Al and Ti as a primary component.

21. An optical recording medium in accordance with Claim 18,

wherein the recording layer containing at least one metal selected from a group consisting of Ni, Cu, Si, Ti, Ge, Zr, Nb, Mo, In, Sn, W, Pb, Bi, Zn and La and at least one element selected from a group consisting of S, O, C and N as a primary component and being added with at least one metal
5 selected from a group consisting of Mg, Al and Ti is formed by a vapor growth process using a target containing at least one metal selected from a group consisting of Ni, Cu, Si, Ti, Ge, Zr, Nb, Mo, In, Sn, W, Pb, Bi, Zn and La and at least one element selected from a group consisting of S, O, C and N as a primary component and a target containing at least one metal
10 selected from a group consisting of Mg, Al and Ti as a primary component.

22. An optical recording medium in accordance with Claim 19, wherein the recording layer containing at least one metal selected from a group consisting of Ni, Cu, Si, Ti, Ge, Zr, Nb, Mo, In, Sn, W, Pb, Bi, Zn and
15 La and at least one element selected from a group consisting of S, O, C and N as a primary component and being added with at least one metal selected from a group consisting of Mg, Al and Ti is formed by a vapor growth process using a target containing at least one metal selected from a group consisting of Ni, Cu, Si, Ti, Ge, Zr, Nb, Mo, In, Sn, W, Pb, Bi, Zn
20 and La and at least one element selected from a group consisting of S, O, C and N as a primary component and a target containing at least one metal selected from a group consisting of Mg, Al and Ti as a primary component.

23. An optical recording medium in accordance with Claim 20,
25 wherein the recording layer containing at least one metal selected from a group consisting of Ni, Cu, Si, Ti, Ge, Zr, Nb, Mo, In, Sn, W, Pb, Bi, Zn and La and at least one element selected from a group consisting of S, O, C and N as a primary component and being added with at least one metal

selected from a group consisting of Mg, Al and Ti is formed by a vapor growth process using a target containing a mixture of ZnS and SiO₂ or a mixture of La₂O₃, SiO₂ and Si₃N₄ as a primary component and a target containing at least one metal selected from a group consisting of Mg, Al and Ti as a primary component.

24. An optical recording medium in accordance with Claim 21, wherein the recording layer containing at least one metal selected from a group consisting of Ni, Cu, Si, Ti, Ge, Zr, Nb, Mo, In, Sn, W, Pb, Bi, Zn and La and at least one element selected from a group consisting of S, O, C and N as a primary component and being added with at least one metal selected from a group consisting of Mg, Al and Ti is formed by a vapor growth process using a target containing a mixture of ZnS and SiO₂ or a mixture of La₂O₃, SiO₂ and Si₃N₄ as a primary component and a target containing at least one metal selected from a group consisting of Mg, Al and Ti as a primary component.

25. An optical recording medium in accordance with Claim 22, wherein the recording layer containing at least one metal selected from a group consisting of Ni, Cu, Si, Ti, Ge, Zr, Nb, Mo, In, Sn, W, Pb, Bi, Zn and La and at least one element selected from a group consisting of S, O, C and N as a primary component and being added with at least one metal selected from a group consisting of Mg, Al and Ti is formed by a vapor growth process using a target containing a mixture of ZnS and SiO₂ or a mixture of La₂O₃, SiO₂ and Si₃N₄ as a primary component and a target containing at least one metal selected from a group consisting of Mg, Al and Ti as a primary component.

26. An optical recording medium in accordance with Claim 19, which comprises a first recording layer, a second recording layer and a third recording layer on the substrate in this order and the first recording layer, the second recording layer and the third recording layer are formed so that the second recording layer has a thickness of 15 nm to 50 nm and that a ratio of the thickness of the third recording layer to the thickness of the second recording layer is 0.40 to 0.70.

27. An optical recording medium in accordance with Claim 19, which comprises a first recording layer, a second recording layer, a third recording layer and a fourth recording layer on the substrate in this order and the first recording layer, the second recording layer, the third recording layer and the fourth recording layer are formed so that the second recording layer has a thickness of 20 nm to 50 nm, that a ratio of the thickness of the third recording layer to the thickness of the second recording layer is 0.48 to 0.93 and that a ratio of the thickness of the fourth recording layer to that of the second recording layer is 0.39 to 0.70.

28. An optical recording medium in accordance with Claim 1, wherein the recording layer farthest from a light incidence plane among the plurality of recording layers includes a first recording film containing Cu as a primary component and a second recording film containing Si as a primary component.

29. An optical recording medium in accordance with Claim 17, wherein the recording layer farthest from a light incidence plane among the plurality of recording layers includes a first recording film containing Cu as a primary component and a second recording film containing Si as a

primary component.

30. An optical recording medium in accordance with Claim 1, wherein the plurality of recording layers are constituted so that data can be
5 recorded therein and data can be reproduced therefrom using a laser beam having a wavelength of 380 nm to 450 nm.

31. An optical recording medium in accordance with Claim 17,
wherein the plurality of recording layers are constituted so that data can
10 be recorded therein and data can be reproduced therefrom using a laser beam having a wavelength of 380 nm to 450 nm.